M272 Engine
Objectives

Students will be able to:

• identify differences between M112 and M272

• explain the camshaft adjusters operation

• identify major components of the M272

• explain function of the swirl flaps

• explain function of the temperature management system
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# M272 – M112 Comparison

<table>
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<tr>
<th>M272</th>
<th>M112</th>
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<tbody>
<tr>
<td><strong>3.5 litre</strong></td>
<td><strong>3.2 litre</strong></td>
</tr>
<tr>
<td>268 hp @ 6000 rpm</td>
<td>214 hp @ 5700 rpm</td>
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<tr>
<td>258 lb-ft @ 2500 to 5000 rpm</td>
<td>228 lb-ft @ 5700 rpm</td>
</tr>
<tr>
<td>Compression Ratio 10.7 : 1</td>
<td>Compression Ratio 10.0 : 1</td>
</tr>
<tr>
<td>Sparkplugs per cylinder 1</td>
<td>Sparkplugs per cylinder 2</td>
</tr>
<tr>
<td>ME 9.7</td>
<td>ME 2.8</td>
</tr>
<tr>
<td>Coil On Plug</td>
<td>Double ignition coils</td>
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Comparison

Red line (Dash) = M112  3 valve

Blue line (solid) = M272  4 valve
New M272 introduced in the new SLK 171

Let's look at some highlights
M272 HighLights

- M112 replacement
- 3.5 litre displacement
- Counter rotating balance shaft
- Stiffer engine with lateral main bearing attachments
- 4 valve continuously variable camshafts intake and exhaust (DOHC)
M272 HighLights

- 90 degree V-6
- Two stage Intake manifold
- Turbulence flaps in the intake ports
- ME 9.7 control unit mounted on top of engine
- Electrically assisted thermostat
- No EGR valve
  - Both cams adjust
Let's take a look at what changed mechanically
Motor Mechanicals

- Based off of M112 engine
- Bore and Stroke increase compared to M112
- Die cast aluminum crankcase
- Silitec coated cylinder liners
- Starter openings both sides of block
- 8 lateral main bearing bolts
Crankshaft

- Crankshaft lighter as compared to M112
- Wider main bearings as compared to M112 used to reduce vibration
- Iron coated cast aluminum pistons
Balance shaft, familiar function

Oil sensor, now a switch
Balance Shaft

- Balance shaft similar to the M112
- Balance shaft rotates opposite crankshaft
Oil Level Switch

• Reed contact oil level switch S43 replaces B40

• Only one pin of the two pin connector used

• S43 mounted in oil pan

• Chain driven oil pump

• Vehicle equipped with an oil level dipstick
Partial and full load crankcase ventilation system
Crankcase Ventilation

Crankcase ventilation diagram

Part load system over volume cut off on left cyl. head cover

Full load system centrifuge on exhaust camshaft
Cylinder head

4 valves

DOHC

Cam adjusters
Cylinder Head

• New design cast aluminum cylinder heads

• 4 overhead camshafts (DOHC)

• 4 valves per cylinder, improve torque and horsepower compared to 3 valve engines

• Camshaft upper bearing surfaces integrated into cam housing cover

• Nickel coated high strength steel exhaust valves
Cylinder Head

- 4 Cam adjusters
- 4 Cam Sensors
- ME can detect Cam position with ignition on
- Intake cam is chain driven and drives exhaust cam via gear
Chain Tensioner

- Step type chain tensioner with internal spring
- Located at the lower right front engine
- Must be manually reset if removed
- Failure to preset tensioner before assembly will result in engine damage
Camshaft Timing Adjusters

- Vane type, oil pressure controlled adjusters
- Continuously variable
- 40° advanced for intake (from 4° BTDC to up to 36° ATDC)
- 40° retard for exhaust (from 30° BTDC to up to 10° ATDC)
Exhaust Cam Gear

Note: Retaining nut at front timing adjuster is reverse thread
Camshaft Position Sensors

- 4 Hall effect sensors, one for each camshaft

- True Power On (TPO) sensor technology capable of detecting cam position with stationary engine

- Right and left camshaft signals staggered by 240° camshaft angle

- Signal is low in absence of a window
Impulse Wheels

- Four impulse wheels used on the M272 mounted on the front of each camshaft timing adjuster
  - Each impulse wheel has a different part number

- The openings of the impulse wheels help ME determine the camshafts exact position

- Can only be used one time!

- If new impulse wheels are not used the pins could shear off causing massive damage to adjusters
Exhaust Cam Gear

- Exhaust Cam 2 piece gear
- Smaller outer gear spring loaded for noise reduction
- Gear must be held in place prior to disassembly
- Segment Ring must be replaced once removed
- Adjuster bolt reverse threaded
Camshaft Timing Network

B6/4 – Camshaft position sensor (intake left)
B6/6 – Camshaft position sensor (exhaust left)
B6/7 – Camshaft position sensor (exhaust right)
B6/5 – Camshaft position sensor (intake right)
B11/4 – Engine coolant temperature sensor
B70 – Crankshaft hall sensor
B2/5 – MAF
N3/10 – ME 9.7
Y49/5 – Camshaft timing control solenoid (exhaust right)
Y49/7 – Camshaft timing control Solenoid (Intake right)
Y49/4 – Camshaft timing control solenoid (intake left)
Y49/6 – Camshaft timing control Solenoid (exhaust left)
Camshaft Position

- Remove camshaft sensors
- Align balancer (305°) to front cover pointer
- Check impulse wheels stamped numbers
- If above line up properly cam positions are correct
Camshaft Timing Basic Position

1. Align balancer to 40° ATDC to front cover pointer
2. Front cover pointer
3. Upper camshaft marks
4. Camshaft marks aligned to head
Intake
Variable runners
Swirl flaps
Intake Manifold

- Magnesium cast sectional intake manifold with integrated vacuum reservoir
- Variable intake runner
- Short runner for higher RPM
- Long runner for lower RPM
- Swirl-Flaps also added providing better fuel mixture
12 Intake manifold with integral vacuum reservoir
12/1 Swirl flap shaft, left cylinder bank
12/2 Swirl flap shaft, right cylinder bank
12/3 Longitudinal switch flap shaft, right cylinder bank
12/4 Longitudinal switch flap shaft, left cylinder bank
22/6 Intake manifold switchover diaphragm
22/9 Swirl valve switchover diaphragm
Y22/6 Variable intake manifold switchover valve
Y22/9 Intake manifold swirl flap switchover valve
Variable Length Intake Manifold

- Engine load over 50% from approx. 1750 RPM intake flaps closed (long runner)
  - Better cylinder filling and increased torque

- Above 3900 RPM switchover solenoid deactivated via ME intake flaps open (short runner)
  - Incoming air follows short runner

- Unlike M112, M272 has two diaphragm actuators
Intake Functional Diagram

A – Long runner
B – Short runner
1 - Switchover flaps
12 – Intake manifold with integral vacuum reservoir
B2/5 – Hot film mass airflow sensor

22/6 – Intake manifold switchover diaphragm
Y22/6 – Variable intake manifold switchover valve
M16/6 – Throttle valve actuator
B70 – Crankshaft hall sensor
N3/10 – ME 9.7
Swirl Flaps

• Under certain operating conditions intake air is swirled via swirl flap for improved mixture process

• Vacuum diaphragm driven by ME controls flap position

• Swirl flap position sensors (hall sensors) monitor 2 magnets attached to swirl flap actuating shafts to determine flap position (activated/not activated)

• Sensors located at rear of intake manifold